UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte THOMAS A. TAYLOR

Appeal 2008-0030
Application 10/630,658
Technology Center 1700

Decided: November 29, 2007

Before EDWARD C. KIMLIN, CHARLES F. WARREN, and JEFFREY T. SMITH, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicant appeals to the Board from the decision of the Primary Examiner finally rejecting claims 1 through 13, 21, and 22 in the Office Action mailed June 28, 2006. 35 U.S.C. §§ 6 and 134(a)(2002); 37 C.F.R. § 41.31(a) (2006).

We affirm the decision of the Primary Examiner.

Claim 1 illustrates Appellant's invention of a method of spraying a material not sensitive to oxidation or nitridation, and is representative of the claims on appeal:

1. A method of thermal spraying a material not sensitive to oxidation or nitridation comprising thermal spraying said material from a thermal spray device with a coaxial gas shield having a shield gas flow substantially surrounding the effluent of the thermal spray device to produce a desired microstructure coating on at least a portion of the surface of a substrate having a complex shape and a standoff distance between the surface of the substrate and the exit end of the shielded thermal spray device is at least 20% longer than the standoff distance of a non-shielded thermal spray device and said shielded gas flowing thermal spraying producing a microstructure coating similar to a microstructure coating that would be produced using the smaller standoff of the non-shielded thermal spraying device, wherein said method using the shield gas exhibits a temperature effect in which the temperature of the thermal spray effluent is substantially higher close to the thermal spray device and the rate of temperature decline with distance from the thermal spray device is substantially lower than without said shield gas, and in which said temperature effect does not continuously increase with increasing flow rate of the shield gas.

The Examiner relies upon the evidence in these references (Ans. 3):

Nowotarski	US 5,486,383	Jan. 23, 1996
Zurecki	US 5,738,281	Apr. 14, 1998

T.A. Taylor, M.P. Overs, B.J. Gill, and R.C. Tucker, Jr. (Taylor), *Experience with MCrAl and thermal barrier coatings produced via inert gas shrouded plasma deposition,* 3 J. Vac. Sci. Technol. A, No. 6, 2526-31 (Nov/Dec 1985).

Appellant requests review of the grounds of rejection of claims 1 through 13, 21, and 22 under 35 U.S.C. 35 U.S.C. § 103(a) advanced on appeal: unpatentable over Zurecki in view of Nowotarski and the admitted prior art in the Specification; and unpatentable over Zurecki in view of Nowotarski and Taylor. (Br. 3; Ans. 3 and 8).

Appellant argues the claims in each ground of rejection as a group. (Br. in entirety). Thus, we decide this appeal based on claim 1. 37 C.F.R. § 41.37(c)(1)(vii)(2006).

The issues in this appeal are whether the Examiner has carried the burden of establishing a prima facie case in each of the grounds of rejection advanced on appeal.

The plain language of claim 1 specifies a method of thermal spraying any material not sensitive to oxidation or nitridation comprising at least the step of thermal spraying the material from any thermal spray device with any manner of coaxial gas shield around the exit of the thermal spray device producing a shield gas flow, with any shield gas, substantially surrounding the effluent exiting the shielded thermal spray device to produce any microstructure coating on at least a portion of the surface of a substrate having a complex shape. The shielded device is used at a standoff distance, that is, the distance from the exit of the device to the substrate, at least 20% longer than with any non-shielded thermal spray device. The microstructure coating thus produced on the surface of the complex shape with a shielded device can be similar in any respect to that produced by any non-shielded device. The shielding gas substantially surrounding the effluent provides a substantially higher temperature to the effluent close, to any extent, to the exit of the shielded device, and a lower rate of temperature decline with distance from the exit of the shielded device, in comparison to any non-shielded device. An increase in the flow rate of the shielding gas does not result in a continuous increase in the effluent temperature close to the exit or lower the rate of temperature decline with distance.

The transitional term "comprising" opens claim 1 to include any manner of other steps and additional materials, such as heating the shielding gas to increase exit standoff. *See, e.g., In re Baxter*, 656 F.2d 679, 686

(CCPA 1981) ("the term 'comprises' permits the *inclusion* of other steps, elements, or materials").

The material not sensitive to oxidation or nitridation includes high melting material, that is "one having a melting point of greater than 2800°F (1538°C)," including "oxides, . . . nitrides, carbides, and other ceramic and nonreactive materials." (Spec. 9:3-11).

We find Nowotarski would have disclosed to one of ordinary skill in this art a method of coating substrate 5 using gas shielded effluent 1a from nozzle 1 of a plasma thermal spray device having coaxial elongated hollow body gas shield 9 having cylindrical passageway 19 to provide a laminar flow for the shielding gas that substantially surrounds effluent 1a. (Nowotarski, e.g., col. 2, l. 45 to col. 3, l. 42, col. 3, l. 63 to col. 4, l. 41, Examples 1 and 2, and Figs. 1 and 2). The coating materials include, "among other things, plastics, metals, alloys, oxides, ceramics, hard intermetallic and metallic compounds and certain glasses," which are entrained in the effluent and heated therein to a softened or molten state. (Nowotarski, col. 3, ll. 43-62). The shielding gas "minimizes the oxidation or contamination or degradation of materials . . . within the turbulent stream since, reactive gases, such as oxygen, in the turbulent stream's surrounding environment is prevented or substantially prevented from being entrained in the turbulent gas." (Nowotarski, col. 4, ll. 20-27).

The diameter 21 of cylindrical passageway 19 of coaxial gas shield 9 can be "larger than or equal to ¼ of . . . standoff distance (23), i.e., a distance between the outlet end of the passageway [19 of coaxial gas shield 9] and a target or a substrate (5), to ensure that the turbulent plasma stream will remain inert until it strikes the target or substrate (5)." (Nowotarski, col. 5,

ll. 53-58, and Figs. 1 and 2). "The nozzle stand off distance (33), i.e., a distance between the opening of the nozzle (11) [sic, (1)] and the substrate [(5)], was about 6 inches," providing "effective thermal properties of the turbulent stream when it strikes" substrate 5; other standoff distances 33 can be used. (Nowotarski, col. 6, ll. 43-48, and Figs. 1 and 2). "This is an improvement over the coaxial shielding technology shown in U.S. Pat. No. 3,470,347, which is normally limited to a stand off distance of about 4 inches." (Nowotarski, col. 6, ll. 48-50; *see also* col. 1, ll. 19-33). "The results [in Table I of Example 2] illustrates that a longer nozzle standoff distance can be achieved by heating a shielding gas," with heating to 540°F resulting in an increase in nozzle standoff distance by about 32%. (Nowotarski, col. 7, ll. 50-51, and Fig. 1). "A further increase is possible when additional shielding fluid or gas is provided coaxially with respect to the turbulent stream" and "[t]he additional shielding fluid flow is preferably laminar." (Nowotarski, col. 7, ll. 54-57).

Taylor would have disclosed to one of ordinary skill in this art that inert gas shrouded, that is, shielded, effluent from shielded plasma torch spraying devices can be used to coat complex surfaces, such as turbine blades, vanes, and seal surface with both a metal alloy bond coat and a ceramic thermal barrier coat. (Taylor, e.g., 2526-27, 2528-29, 2530-31, and Figs. 3-6). With the shrouded plasma spray (SPS) method, "duplex thermal barrier coatings consisting of a metallic undercoat and oxide overcoat can be applied in the same setup, using the same torch by simply switching from one powder dispenser to another." (Taylor, 2527, left col., ll. 21-24).

We find Zurecki would have disclosed to one of ordinary skill in this art a method using a thermal spray device having nozzle 17 that is

surrounded by coaxial gas shield 20 which forms shield gas flow substantially surrounding the effluent of the thermal spray device. (Zurecki, e.g., Abstract, col. 2, l. 61 to col. 3, l. 60, col. 6, ll. 54-63, col. 8, ll. 16-18).

We find Appellant acknowledges it was known in the art to apply ceramic coatings by plasma thermal spraying, including thermal barrier coatings on the complex surfaces of turbine blades, vanes, and seals. (Spec., e.g., 4:21-23 and 28-30, and 5:1-5 and 15-22).

We determine the combined teachings of Zurecki, Nowotarski, and the acknowledged prior art in the Specification as well as of Zurecki, Nowotarski and Taylor, the scope of which we determined above, provide convincing evidence supporting the Examiner's case that the claimed method encompassed by claim 1, as we interpreted this claim above, would have been prima facie obviousness to one of ordinary skill in the coating arts familiar with the use of shielded and non-shielded plasma thermal spray devices to apply ceramic coatings to substrates having a complex shape. Indeed, Nowotarski and Taylor disclose that ceramic materials, disclosed and claimed by Appellant, can be coated on surfaces via gas shielded or shrouded effluent from a plasma thermal spray devices. Taylor further discloses that the so-coated surfaces can be complex, including turbine blades, vanes and seals, which complex surfaces are known in the art to be coated by ceramic via plasma thermal spray devices as Appellant acknowledges.

Nowotarski further teaches that the particular shielded plasma thermal spray devices taught therein provide better standoff and thermal properties of the shielded effluent compared to other shielded plasma thermal spray devices. This reference recognizes the temperature effect of heated

shielding gas on standoff and the effect of increased flow of the shielding gas on standoff. Thus, we are of the view that one of ordinary skill in this art would have recognized that Nowotarski's shielded plasma thermal spraying devices can be used to apply ceramic coatings to complex surfaces with a larger standoff parameter than would be achieved with other shielded thermal spray devices, and thus of non-shielded thermal spray devices, and that the standoff parameter can be further improved by increasing the temperature and amount of the shielding gas.

Accordingly, on this record, we agree with the Examiner that prima facie one of ordinary skill in this art routinely following the combined teachings of the prior art and knowledge in the prior art as applied would have reasonably arrived at the claimed method encompassed by claim 1 without recourse to Appellant's Specification. *See, e.g., KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1739 (2007) (a patent claiming a combination of elements known in the prior art is obvious if the improvement is no more than the predictable use of the prior art elements according to their established functions); *In re Kahn*, 441 F.3d 977, 985-88 (Fed. Cir. 2006); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art."); *In re Sovish*, 769 F.2d 738, 743 (Fed. Cir. 1985) (skill is presumed on the part of one of ordinary skill in the art); *In re Bozek*, 416 F.2d 1385, 1390 (CCPA 1969) ("Having established that this knowledge was in the art, the examiner could

then properly rely, as put forth by the solicitor, on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.'").

Appellant contends that '[i]t would be thought by those skilled in the art to be nonsensical to use . . . a shield when spraying a material not sensitive to oxidation or nitridation as claimed" and that it was discovered that the temperature effects "are additional benefits to be gained using such a shield." (Br. 4-6). The Examiner contends Nowotarski and Taylor establish that a shielded effluent from a shielded thermal spraying device can be used to apply a ceramic coating. (Ans. 14-15). The Examiner further contends the specified temperature effects "would naturally occur with the use of" the shielded thermal spray device as taught by the applied prior art, and that Appellant "has recognized another advantage" of the prior art process. (Ans. 8, 13-14, and 15-16). We agree with the Examiner. Indeed, Nowotarski and Taylor provide the teachings pointed out by the Examiner.

Nowotarski further discloses the temperature effects of the shielding gas on the standoff parameter and the thermal properties of the effluent when striking a surface. Indeed, Nowotarski discloses the effects of device design and temperature and flow rate of the shielding gas on the standoff parameter. That Nowotarski may not have disclosed the temperature effects as claimed in claim 1 does not benefit Appellant as it is well settled that Appellant's elucidation of the mechanism of an old process or discovery of a new benefit of that process does not render the old process again patentable simply because those practicing the process may not have appreciated the mechanism or the results produced thereby. *See, e.g., In re Spada*, 911 F.2d

705, 707 (Fed. Cir. 1990); *In re Woodruff*, 919 F.2d 1575, 1577 (Fed. Cir. 1990); *W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1548 (Fed. Cir. 1983) ("[I]t is . . . irrelevant that those using the invention may not have appreciated the results[,] . . . [otherwise] it would be possible to obtain a patent for an old and unchanged process." (citations omitted)); *In re Skoner*, 517 F.2d 947, 950 (CCPA 1975).

We are of the view that Appellant's further contentions are inadequate to establish either "obvious to try" and "hindsight." (Br. 6-12). Indeed, the teachings of the references and the acknowledged prior art, particularly Nowotarski and Taylor, on which Appellant relies in these respects do not represent the full scope of the teachings and inferences which one of ordinary skill in the art would have found therein, as seen from the findings of the Examiner in the Answer and our further findings above.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Zurecki, Nowotarski, and the acknowledged prior art in the Specification as well as of Zurecki, Nowotarski, and Taylor, with Appellant's countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1 through 13, 21, and 22 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(2007).

AFFIRMED

PL/PL Initials
sld/ls

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